

Species

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The Diversity and abundance of bird species in Urban landscape; Barkatullah University Campus, Bhopal, India

Akshada Ahir, Yogesh Singh

ABSTRACT

Birds are essential in any ecosystem, such as prey, predators, pollinators, scavengers, seed dispersals, and ecosystem engineers. The diversity of birds plays a significant role in determining the health of an ecosystem. This study prepares the checklist of birds at Barkatullah University, Bhopal. The species of the birds were recorded using point count and line transect methods. The study was performed on eight sites. The present study notices a positive relationship between healthy ecosystems and the birds recorded. The university campus has a huge variety of trees, which leads to a richness of bird species on the premises.

Keywords: Bird diversity, Abundance, Barkatullah University

1. INTRODUCTION

Birds are some of the most prominent species on the Earth and are sensitive to environmental changes (Pradhan et al., 2023; Jha & Devkota, 2023). They act as an integral part of the food chain and web by playing an essential role in the ecosystem. They also help in the pollination of owners and the dispersal of seeds (Singh et al., 2018). A population of birds is a sensitive indicator of pollution in both terrestrial and aquatic ecosystems. Avifauna is one of the most critical ecological indicators to evaluate the quality of habitats. Water birds are considered as indicators of the quality of the wetland ecosystem and form the terminal links in many aquatic food chains, as a result, they reflect Changes originating in several different ecosystem components (Lodhi et al., 2017). Bird community evaluation has become an essential tool in biodiversity conservation and for identifying conservation actions in areas of high human pressure (Lodhi et al., 2017).

The Indian subcontinent is known for its diverse and rich bird species whose taxonomy, distribution, and general habitat characteristics are well-documented (Sethy et al., 2015; Kaleka et al., 2023). Birds are considered excellent bio-indicators of the effects urbanization has on the ecosystem since they are highly diverse and conspicuous parts of the ecosystem also, they respond rapidly to changes in landscape configuration, and composition, and are used as indicators of long-term

environmental disturbance, such as urbanization and land use change (Sidra et al., 2013; Kushwaha et al., 2023). The Indian subcontinent, with its highly varied climatic conditions, diverse habitat, and long stretch of vegetation, attracts and supports diverse avifauna, including a large number of endemic species around the year. Out of more than 9,000 birds in the world, the Indian subcontinent harbours about 1,300 species, or over 13% of the world’s birds.

2. MATERIAL AND METHODS

Study Area

The study occurred between January and May 2022 in eight different places on the Barkatullah University campus in Bhopal (Table 1, Figure 1). Out of eight locations, two (Mullah Sarovar and K.C. Nayar Pond) are aquatic ecosystems, and the other six are terrestrial habitats. The study locations were frequently visited throughout the study period to acquire data on the diversity of birds. The GPS coordinates were taken during the study to create a Google Earth map of the research area (Table 1).

Table 1 Study sites with GPS coordinates of BU Campus.

Study Sites	Site Code	Latitude	Longitude
Department of Applied Aquaculture and Zoology	S 1	23°11'43"	77°27'12
Charak Medicinal Garden	S 2	23°12'18"	77°26'46
Professor and Staff Residential Quarters	S 3	23°12'23"	77°27'32
Hostel Area	S 4	23°12'16"	77°26'56
BUIT	S 5	23°12'11"	77°27'21
Administrative Block, Satya Bhawan	S 6	23°12'40"	77°26'54
Mullah Sarovar	S 7	23°12'14"	77°27'10
KC Nayar Pond	S 8	23°11'56"	77°27'30



Figure 1 Showing map of Barkatullah University, Bhopal, (M.P)

2. METHODOLOGY

The data collection was performed by incorporating the line transect method and point count method. Line Transect Method - A one km to two km long line transect was used for the study. The width of the sampling area was 50 m (25 m on each side). Either Point Count Method - an observer stands at a fixed point for a specific period (10 minutes) and makes a count of all birds, within a specified circle of 10-15 meters or as far as the visibility, permits (open radius). For intensive study purposes research instruments used for the

collection of the data are Nikon field Binocular (40X zoom), and Garmin (60) is used to point out the global positioning system (latitude and longitude) of the location. Nikon Digital Camera (D60, 70-300mm). Data of birds was collected by direct count methods and counting flock methods were used separately to find the bird species diversity. The hours of the survey were distributed in two parts, 5 hours in the morning (06:00 am to 11:00 am) and 3 hours in the evening (04:00 pm to 07:00 pm.). Eight study locations at Barkatullah University were selected for the study. Six sites were studied using the line transect approach, while two were studied using the point count method (Table 2).

Table 2 List the sites surveyed in the areas Barkatullah University Campus.

Site	Covered length (M)	Method
S 1	1200	Line Transect
S 2	1100	Line Transect
S 3	1000	Line Transect
S 4	1200	Line Transect
S 5	1200	Line Transect
S 6	1000	Line Transect
S 7	300	Point Count
S 8	300	Point Count

3. RESULTS

Following 150 days of continuous data collection, from January to May 2022, 57 bird species were recorded. The details are specified in (Table 3). Out of these Twenty-five bird species belong to the order Passeriformes, which are vibrant bird species within the recorded bird order (Table 3). The study also established a relationship between the area of forest in the university and the pond and the richness of bird species. Passeriformes was found to be the most dominant, represented by twenty-five species, followed by Charadriiform (five species) and Psittaciformes (five species), Data on Coraciiformes (Three species), and the rest of the orders vary respectively (Table 3).

Table 3 Bird diversity species the study area

S. No	Order	No. of Family	No. of species
1	Passeriformer	16	25
2	Anseriformer	1	4
3	Gruiformes	1	2
4	Cuculiformes	1	2
5	Charadriiform	5	5
6	Suliformes	1	1
7	Coraciiformes	2	3
8	Psittaciformes	1	5
9	Columbiformes	1	1
10	Piciformes	1	1
11	Apodiformes	1	1
12	Accipitriformes	1	1
13	Pelecaniformes	1	4
14	Galliformes	1	1
15	Bucerotiformes	1	1
Total		35	57

All of the study area's locations (S1 to S8) at Barkatullah University yielded 57 species, 35 families, and 15 orders. The S1 location had the highest average bird presence (26 ± 6.72), and the S3 location had the lowest (19.8 ± 3.54). Similar to this, during the study, 36 bird species were reported highest in April at S1, and 15 bird species were recorded lowest in May at S3 (Table 4, Figure 2).

Table 4 Occurrence of birds and their mean populations

Study site	Frequency (month-wise)					Mean	SD
	Jan	Feb	Mar	April	May		
S 1	24	31	17	36	22	26.0	6.72
S 2	30	27	20	26	19	24.4	4.22
S 3	25	20	22	17	15	19.8	3.54
S 4	20	25	18	22	16	20.2	3.12
S 5	27	30	24	21	20	24.4	3.72
S 6	26	28	19	25	22	24.0	3.16
S 7	29	22	18	20	24	22.6	3.77
S 8	24	28	20	22	29	24.6	3.44



1. Coppersmith Barbet



2. Green Bee-eater



3. House Sparrow



4. Gray Hornbill



Figure 2 Recorded bird species (© - Authors)

Table 5 indicates the IUCN status of the bird's diversity. Fifty-seven birds belonged to fifteen orders and thirty-five families. Fifty-five bird species were at Least concerned (LC); one bird species was Near Threatened (NT), while one species was Vulnerable (V) at Barkatullah University Campus (Table 5, Figures 3 & 4).

Table 5 List of Birds recorded during the present study

Order	Family	Common Name	Scientific Name	IUCN Status
Passeriformer	Muscicapidae	Oriental Magpie	<i>Copsychus saularis</i>	LC
		Verditer Flycatcher	<i>Eumyias thalassinus</i>	LC
		Indian Robin	<i>Saxicoloides fulicatus</i>	LC
		Tickell's Blue Flycatcher	<i>Cyornis Tickelliae</i>	LC
		Brow Rock Chat	<i>Oenanthes fusca fusca</i>	LC
		Siberian Stone Chat	<i>Saxicola rubicola</i>	LC
	Sturnidae	Pied Myna Starling	<i>Gracupica contra</i>	LC
	Passeridae	House Sparrow	<i>Passer domesticus</i>	LC
	Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i>	LC
	Leiothrichidae	Jungle Babbler	<i>Argya striata</i>	LC
	Cisticolidae	Ashy Prinia	<i>Prinia socialis</i>	LC
		Plain Prinia	<i>Prinia inornata</i>	LC
		Common Tailor Bird	<i>Orthotomus sutorius</i>	LC
	Corvidae	House Crow	<i>Corvus splendens</i>	LC
		Rufous Treepie	<i>Dendrocitta vagabunda</i>	LC
	Rhipiduridae	White-Browed Fantail	<i>Motacilla maderaspatensis</i>	LC
	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>	LC
		Ashy Drongo	<i>Dicrurus leucophaeus</i>	LC
	Estrildidae	Indian Sliver Bill	<i>Euodice malabrica</i>	LC
	Alaudidae	Oriental Skylark	<i>Alauda gulgula</i>	LC
	Oriolidae	Golden Oriole	<i>Oriolus kund</i>	LC
	Hirundinidae	Barn Swallow	<i>Hirundo rustica</i>	LC
	Aegithalidae	Common Iora	<i>Aegithina sophia tiphia</i>	LC
	Motacillidae	White Wagtail	<i>Motacilla alba</i>	LC
	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>	LC
Anseriformer	Anatidae	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	LC
		Garganey	<i>Spatula querquedula</i>	LC
		Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	LC
		Northern Shoveler	<i>Spatula clypeata</i>	LC
Gruiformes	Rallidae	Common Moorhen	<i>Fulica atra</i>	LC
		White-breasted Water Hen	<i>Phoenicurus ochruros</i>	LC
Cuculiformes	Cuculidae	Greater Coucal	<i>Centropus sinensis</i>	LC
		Asian koel	<i>Eudynamis scolopaceus</i>	LC
Charadriiform	Scolopacidae	Common Sandpiper	<i>Actitis hypoleucos</i>	LC
	Laridae	River Tern	<i>Sterna aurantia</i>	V
	Charadriidae	Red-Wattled Lapwing	<i>Vanellus indicus</i>	LC
	Jacaniidae	Bronze Winged Jacana	<i>Metopidius indicus</i>	LC
	Recurvirostridae	Black-winged Stilt	<i>Himantopus Himantopus</i>	LC
Suliformes	Phalacrocoracidae	Little Cormorant	<i>Microcarbo niger</i>	LC
Coraciiformes	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>	LC
		White-throated Kingfisher	<i>Halcyon gularis</i>	LC
	Meropidae	Green Bee eater	<i>Merops viridis simus</i>	LC
Psittaciformes	Psittaculidae	Rose-ring Parakeet	<i>Psittacula krameri</i>	LC
Columbiformes	Columbidae	Laughing Dove	<i>Spilopelia senegalensis</i>	LC
		Spotted Dove	<i>Spilopelia chinensis</i>	LC
		Green Pigeon	<i>Trepona phoenicopterus</i>	LC
		Rock Pigeon	<i>Columba livia</i>	LC
		Collared Dove	<i>Streptopelia decaocto</i>	LC

Piciformes	Megalaimidae	Coppersmith Barbet	<i>Megalaima haemacephala</i>	LC
Apodiformes	Apodidae	Little Swift	<i>Apus affinis</i>	NT
Accipitriformes	Accipitridae	Shikra	<i>Accipiter badius</i>	LC
Pelecaniformes	Ardeidae	Indian Pond Heron	<i>Ardeola grayii</i>	LC
		Little Egret	<i>Egretta garzetta</i>	LC
		Intermediate Egret	<i>Ardea intermedia</i>	LC
		Cattle Egret	<i>Bubulcus ibis</i>	LC
Galliformes	Phasianidae	Indian Peafowl	<i>Pavo cristatus</i>	LC
Bucerotiformes	Bucerotidae	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	LC

Total recorded species and Percentage

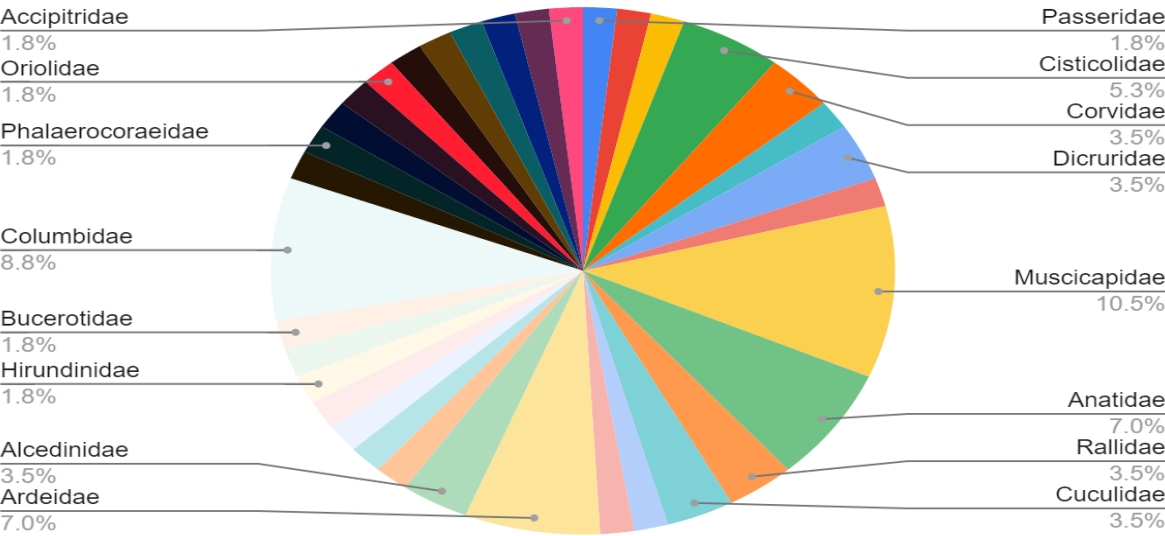


Figure 3 Recorded families with Species and percentage of study area

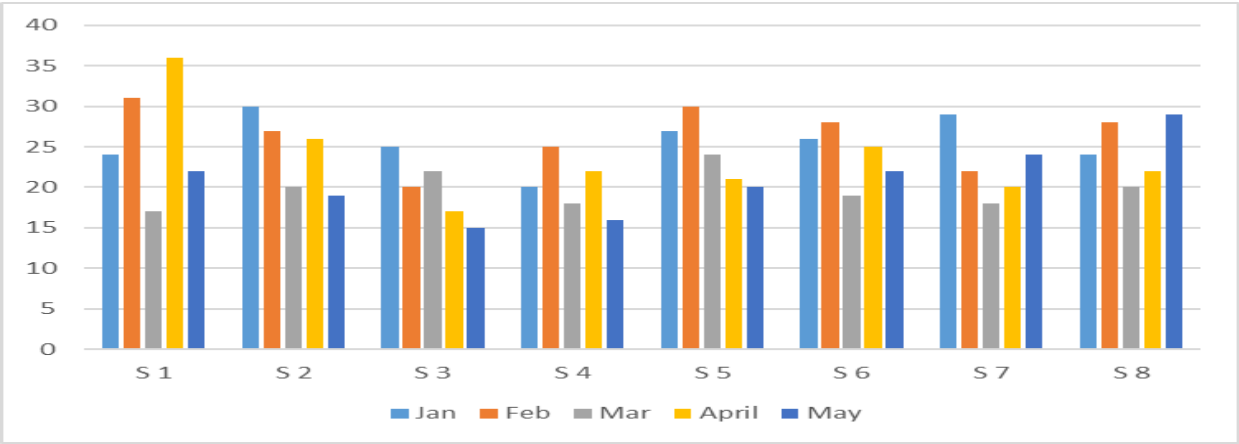


Figure 4 Bird Species recorded in the study area

4. DISCUSSION

Most of researchers analyzed urban avoiders, suburban adapters, and urban exploiters (Blair, 1996; McKinney, 2002). In the same way, the university campus is an urban landscape, which provides support to bird species. The dominance of a few species is typical in urban bird communities Beissinger and Osborne, (1982), Marzluff, (2001), and most species that comprise the communities introduced

in the study. Low spatial variation in urban bird populations is expected in future, which may result in more similar bird group's worldwide (Jokimaki and Huhta, 1996). Passeriformes were found to be the most prominent order, followed by Charadriiformes, Psittaciformes, Coraciiformes, and the rest.

The most common birds seen are the House Sparrow, Jungle Babbler, Common Myna, Blue Rock Pigeon, Spotted Dove, Black Drongo, Racket-Tailed Drongo, Rufous Treepie, Black Kite, and Bulbul. Several other species of birds, including the Hoopoe, Indian Grey Hornbill, Woodpecker, Marsh Harrier, Shikra, Papiha, Indian Golden Oriole, and Indian Roller, as well as several migrant birds, including Rosy Starlings and Yellow-Footed Green Pigeons, were there during the research period but only sometimes seen.

5. CONCLUSION

The result shows that there is Significant diversity and species richness in the university at the university campus. It may be due to habitat characteristics, water and food availability, shelter and climatic conditions. The present study indicates that the University campus supports an excellent diversity of birds. The location of the university campus, as well as the presence of more aquatic food and insect food in the university forest, water, and enhanced flora, could all contribute to variations in the bird diversity in the selected study sites. Overall, throughout the study period, there was no variation in the variety of bird species at any of the study sites. The study suggests that for the protection and study of birds, all research locations have the same importance. This type of study is crucial because it sheds light on biological variety and increases locals' understanding of the value of aquatic habitats.

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Authors' Contribution

Akshada Ahir: Manuscript writing, data interpretation, and Manuscript editing; Yogesh Singh: Supervision, editorial inputs, and technical inputs.

Informed consent

Not applicable.

Ethical approval

The ethical guidelines for birds and their census are followed in the study for sample collection & identification.

Conflicts of interests:

The authors declare that there are no conflicts of interests.

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Data and materials availability

All data associated with this study are present in the paper.

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